Sonography of Greater Trochanteric Pain Syndrome and the Rarity of Primary Bursitis

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OBJECTIVE. Greater trochanteric pain syndrome is a common condition with clinical features of pain and tenderness at the lateral aspect of the hip. Diagnosing the origin of greater trochanteric pain is important because the treatment varies depending on the cause. We hypothesized that sonographic evaluation of sources for greater trochanteric pain syndrome would show that bursitis was not the most commonly encountered abnormality.

MATERIALS AND METHODS. We performed a retrospective review of musculoskeletal sonographic examinations performed at our institution over a 6-year period for greater trochanteric pain syndrome; completed a tabulation of the sonographic findings; and assessed the prevalence of trochanteric bursitis, gluteal tendon abnormalities, iliotibial band abnormalities, or a combination of findings. Prevalence of abnormal findings, associations of bursitis, gluteal tendinosis, gluteal tendon tears, and iliotibial band abnormalities were calculated.

RESULTS. The final study population consisted of 877 unique patients: 602 women, 275 men; average age, 54 years; and age range, 15–87 years). Of the 877 patients with greater trochanteric pain, 700 (79.8%) did not have bursitis on ultrasound. A minority of patients (177, 20.2%) had trochanteric bursitis. Of the 877 patients with greater trochanteric pain, 438 (49.9%) had gluteal tendinosis, four (0.5%) had gluteal tendon tears, and 250 (28.5%) had a thickened iliotibial band.

CONCLUSION. The cause of greater trochanteric pain syndrome is usually some combination of pathology involving the gluteus medius and gluteus minimus tendons as well as the iliotibial band. Bursitis is present in only the minority of patients. These findings have implications for treatment of this common condition.

Keywords: bursitis, gluteal tendinosis, gluteal tendon tear, greater trochanteric pain, iliotibial band

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Greater trochanteric pain syndrome is a common condition with clinical features including pain and tenderness at the lateral aspect of the hip. Although greater trochanteric pain is often attributed to greater trochanteric bursitis, other diagnoses, such as gluteus medius or minimus tendinosis, tear, or both [1] and abnormalities of the adjacent iliotibial band [2], have emerged as more likely causes of trochanteric pain. Rather than originating from bursal inflammation [3], it has been suggested that fluid in the greater trochanteric bursa is secondary to a gluteal tendon abnormality, analogous to fluid in the subacromial subdeltoid bursa in the setting of rotator cuff tears of the shoulder [4].The largest of the bursa near the greater trochanter, the trochanteric bursa, is superficial to the posterior facet of the greater trochanter and the lateral facet insertion of the gluteus medius tendon. The subgluteus medius bursa is located deep in relation to the gluteus medius tendon at the superior aspect of the lateral facet, and the subgluteus minimus bursa is located over the anterior facet deep in relation to the gluteus minimus tendon [5].

Diagnosing the specific origin of greater trochanteric pain is important because the treatment varies depending on the cause. Corticosteroid injection often is performed for bursitis, whereas muscle strengthening or surgery or both may be beneficial for gluteal tendinosis and tears [4]. Although there has been debate whether bursal corticosteroid injection improves long-term pain in greater trochanteric pain syndrome [6], short-term effectiveness has been shown after ultrasound-guided peritendinous injection of corticosteroid for gluteus medius tendinosis [7]. Furthermore, endoscopic repair of gluteus medius tears has been shown to provide pain relief and return of strength after short-term follow-up in one small study group [8].

We hypothesized that sonographic evaluation of sources for greater trochanteric pain syndrome would show that bursitis was not

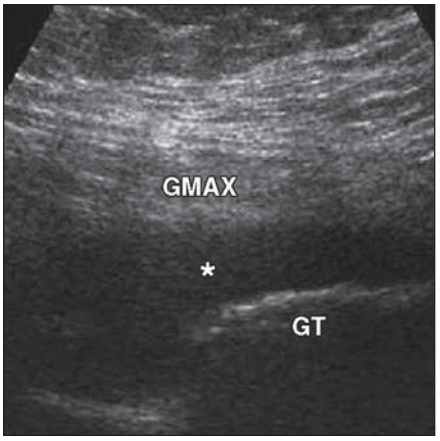

Fig. 1—71-year-old woman with greater trochanteric bursitis. Coronal ultrasound image of posterior facet of greater trochanter (GT) shows anechoic fluid in greater trochanteric bursa (*asterisk*) deep in relation to gluteus maximus muscle (GMAX); 20 mL of fluid was aspirated from bursa under ultrasound guidance.

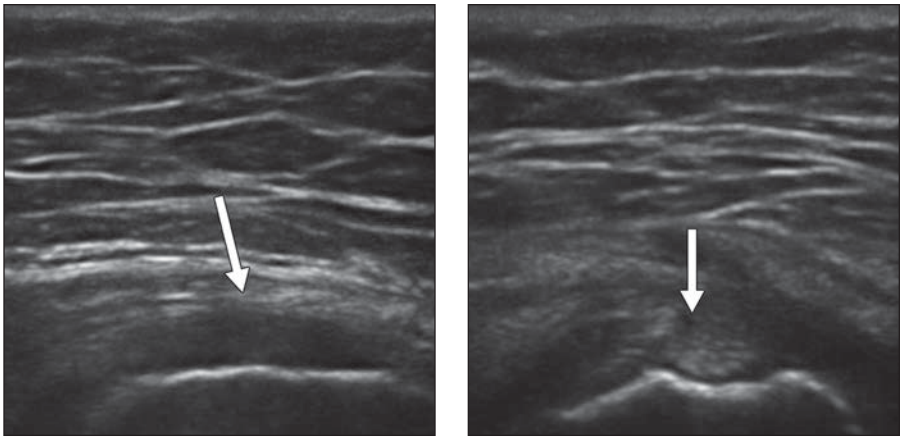

Fig. 2—64-year-old woman with gluteus medius tendinosis.
A and **B,** Coronal (**A**) and transverse (**B**) ultrasound images of lateral facet of greater trochanter show thick and hypoechoic gluteus medius tendon (*arrows*) with loss of normal fibrillar pattern.

the most commonly encountered abnormality. We performed a retrospective case review of musculoskeletal sonographic examinations performed at our institution over a 6-year period; completed a tabulation of the sonographic imaging findings; and assessed the prevalence of trochanteric bursitis, gluteal tendon abnormalities, and iliotibial band abnormalities.

Materials and Methods

The institutional review board approved this retrospective search of the department of radiology database of reports of musculoskeletal sonography performed by two radiologists with 15 and 2 years of musculoskeletal sonography experience from January 1, 2005, through December 31, 2010. The search keywords included "greater trochanteric," "trochanteric," "gluteus medius," and "gluteus minimus." The search yielded 1348 reports. The following exclusion criteria then were applied: examinations not pertaining to the greater trochanteric region, repeat examinations in the same patient, hip arthroplasty patients, and patients without a complaint of greater trochanteric pain or tenderness as determined by the provided clinical history or ultrasound-guided palpation.

In our practice, initial sonography of the greater trochanteric region is performed by one of six sonographers trained in musculoskeletal ultrasound using a 12-MHz linear probe in average sized patients or a 9-MHz linear probe in larger patients (iu22, Philips Healthcare). Images include coronal and transverse views of the anterior facet of the greater trochanter at the gluteus minimus tendon insertion, the lateral and superoposterior facets at the gluteus medius tendon insertions, the iliotibial band, and the greater trochanteric bursa at the level of the posterior facet. In addition, patients are rescanned by the radiologist if there is a diagnostic question or if an imaging-guided procedure is to be performed. Findings recorded by the radiologist in the dictated reports form the basis for this retrospective analysis.

A checklist of positive findings in the radiology reports was completed, which included greater trochanteric bursitis, defined as anechoic or hypoechoic fluid in the greater trochanteric bursa; gluteus medius or minimus tendinosis, defined as a thickened heterogeneous tendon with loss of normal fibrillar pattern with or without superimposed calcifications [9–11]; gluteus medius or minimus tears, defined as a partial- or full-thickness interruption of the fibrillar pattern of the tendon that may be fluid filled or depicted by loss of tendon mass; iliotibial band thickening, defined as fusiform enlargement of the band at the greater trochanter; or iliotibial band tear, defined as an anechoic defect within the band. Prevalence of abnormal findings by age and sex and associations of bursitis, gluteal tendinosis, gluteal tendon tears, and iliotibial band abnormalities were calculated using the chi-square test or Student t test with significance assigned as $p < 0.05$.

Results

The final study population was composed of 877 unique patients: 602 women and 275 men; average age, 54 years; age range, 15–87 years. The 877 studies were of native hips; 20 patients with hip arthroplasty were excluded. Of the 877 patients with greater trochanteric pain, 700 (79.8%) did not have bursitis on ultrasound. A minority of patients (177, 20.2%) had greater trochanteric bursitis (Fig. 1). Three patients had subgluteus medius bursitis, and no patients had subgluteus minimus bursitis.

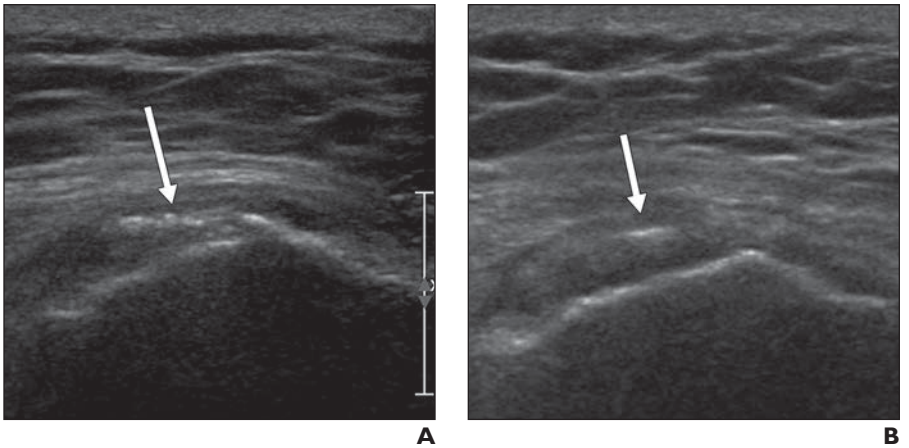

Fig. 3—77-year-old woman with greater trochanteric pain syndrome and gluteus minimus calcific tendinosis.
A and **B,** Coronal (**A**) and transverse (**B**) ultrasound images of anterior facet of greater trochanter show echogenic calcifications (*arrows*) within tendon and tendon thickening. Patient was tender with pressure applied on tendon.

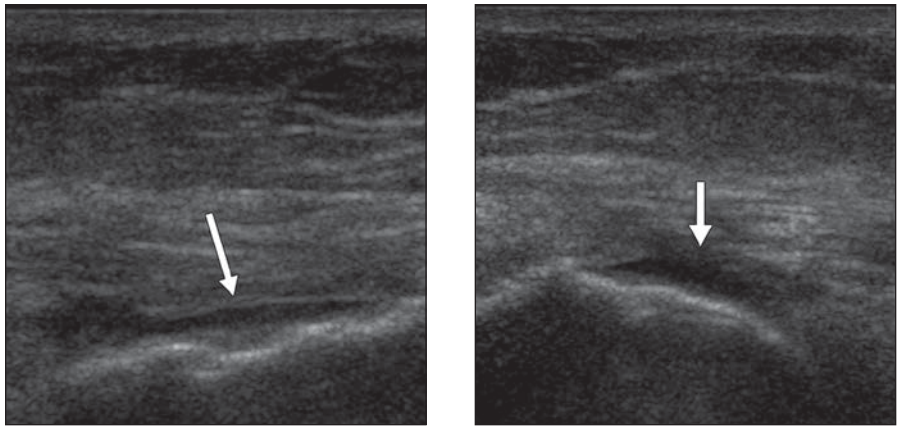

Fig. 4—59-year-old woman with greater trochanteric pain syndrome and full-thickness gluteus minimus tendon tear.
A and **B,** Coronal (**A**) and transverse (**B**) ultrasound images of anterior facet of greater trochanter show anechoic tendon gap (*arrows*) in expected location of tendon.

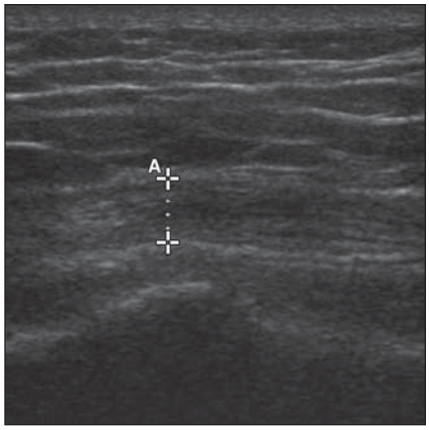

Fig. 5—62-year-old man with thickening of iliotibial band (ITB) at greater trochanter. Coronal image at promontory of greater trochanter shows 6-mm-thick ITB (*calipers*). Patient was tender over ITB.
A indicates distance between calipers.

Of the 877 patients with greater trochanteric pain, 438 (49.9%) had gluteal tendinosis: 236 of 877 (26.9%) had isolated gluteus medius tendinosis (Fig. 2), of which 124 of 236 (52.5%) were calcific; 143 of 877 (16.3%) had isolated gluteus minimus tendinosis, of which 61 of 143 (42.7%) were calcific (Fig. 3); and 59 of 877 (6.7%) had both gluteus medius and minimus tendinosis of which 22 of 59 (37.3%) were calcific. Two of 877 (0.2%) patients had partial-thickness and 2 (0.2%) had full thickness gluteus medius tendon tears. Six of 877 (0.7%) patients had partial thickness and 7 (0.8%) had full-thickness gluteus minimus tendon tears (Fig. 4). Of the 877 patients with greater trochanteric pain, 622 (70.9%) had a normal iliotibial band, 250 (28.5%) had a thickened iliotibial band (Fig. 5), and five (0.6%) had a partial tear of the iliotibial band (Fig. 6).

Table 1 shows ultrasound findings of the study groups by age and sex. Patients with ultrasound abnormalities were older (average age, 59 years) than those with normal studies (average age, 49 years; $p < 0.0001$). There was no difference in age between patients with bursitis compared with patients with gluteal tendinosis or tear. Although bursitis was not the most common abnormality in the study population, women were overrepresented (131/177, 74.0%) in the group with bursitis compared with the group without bursitis ($p < 0.01$).

Table 2 shows the frequency of singular and combined ultrasound findings of the study population. One half (438/877, 49.9%) of patients had tendinosis. In 83% (362/438) of patients with tendinosis, tendinosis was the only sonographic abnormality. Only 8.1% (70/877) had bursitis as the only abnormality.

Discussion

Ultrasound is an established modality for characterizing hip abductor tendon abnormalities, including tendinosis and tears both in patients with and without hip replacement, and ultrasound is an excellent modality in which to depict excess fluid in the bursa at the greater trochanter and to show abnormalities of the iliotibial band [9–12]. A retrospective MRI study by Blankenbaker et al. [13] showed that MRI findings of gluteal tendinosis or bursitis are poor predictors of greater trochanteric pain syndrome and are often present in asymptomatic patients. Sonography has advantages over MRI in this

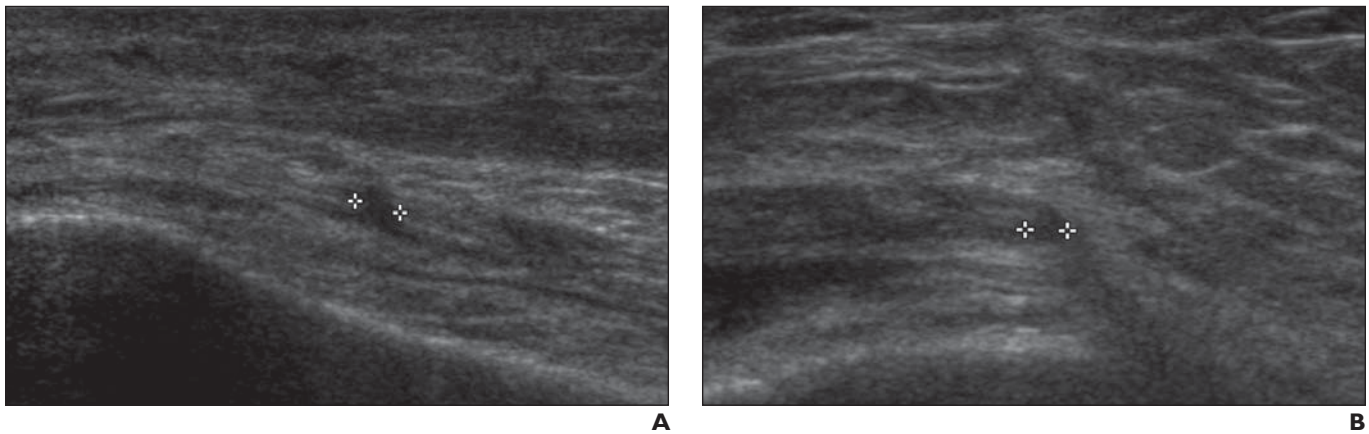

Fig. 6—47-year-old woman with greater trochanteric pain syndrome and iliotibial band (ITB) tear.
A and **B,** Coronal (**A**) and transverse (**B**) ultrasound images of proximal lateral femur just distal to greater trochanter show partial-thickness tear of deep fibers of iliotibial band depicted by focal anechoic gap (*calipers*) in ITB. Patient was focally tender over defect.

TABLE 1: Findings on Sonography of 877 Patients Evaluated for Greater Trochanteric Pain Syndrome

Total Population (n = 877)		Women	
Finding	No.	Average Age (y)	No.
Greater trochanteric bursitis	177 (20.2)	58	131 (74.0)
No bursitis	700 (79.8)		
Gluteal tendinosis	438 (49.9)	60	270 (61.6)
Gluteal tendon tears	17 (1.9)	63	13 (76.5)
ITB abnormalities (thickening, tears)	255 (29.1)	54	164 (64.1)
No abnormalities	115 (13.1)	50	79 (69.7)

Note—Data in parentheses are percentages. ITB = iliotibial band.

TABLE 2: Isolated and Combined Ultrasound Findings in 877 Patients With Greater Trochanteric Pain

Finding	No. (%)
Bursitis alone	70 (8.1)
Gluteal tendinosis alone	362 (41.3)
Gluteal tear alone	0 (0.0)
ITB abnormality alone	152 (17.3)
Gluteal tendinosis and bursitis	70 (8.0)
Gluteal tears and bursitis	5 (0.6)
ITB abnormality and any other abnormality (tendinosis, bursitis)	103 (11.7)
Normal	115 (13.1)

Note—ITB = iliotibial band.

regard because it enables the assessment of tenderness while pressure is applied over the particular gluteal tendon or bursa in question and may, in some cases, be used for imaging-guided diagnostic anesthetic injection.

Our data show that only 8.1% of patients evaluated for greater trochanteric pain have isolated bursitis, whereas 41.3% have isolated gluteal tendinosis, particularly involving the gluteus medius. Few patients with greater trochanteric pain in our study had either partial- or full-thickness gluteal tendon tears. A thickened iliotibial band at the level of the greater trochanter was seen more frequently (29%) than bursitis in patients with greater trochanteric pain. In our large study, women were twice as likely as men to have greater trochanteric pain syndrome, extending the observations of previous smaller series.

A limitation of our study is its retrospective methodology without surgical or pathologic confirmation or validation by another imaging modality (e.g., MRI). Another limitation is that two radiologists performed and interpreted the sonographic studies, and the studies were not reread. Therefore, the results are contingent on their interpretations of the findings. We thought that this study design was appropriate, however, because our aim was to tabulate sonographic findings seen in greater trochanteric pain syndrome, not to evaluate diagnostic accuracy of sonography per se. Finally, referral bias of certain patient groups to our academic regional center cannot be eliminated and therefore the results may not be generalizable to all practices.

Conclusion

The cause of greater trochanteric pain syndrome is usually some combination of pathology involving the gluteus medius and gluteus minimus tendons as well as the iliotibial band. Bursitis is present in only the minority of patients. These findings have implications for treatment of this common condition.

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